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A Device-Based Tank Gunnery Training Strategy for the Army National Guard

A proficiency-based strategy allows the device-based portion of tank gunnery training to be completed in three drill weekends.

With relatively little training time available each year, Army National Guard armor unit trainers continually face the question of how to use devices most efficiently while training tank crews for successful Tank Table VIII (TTVIII) qualification. Some guidance is available, but time constraints always seem to force compromises.

These compromises may no longer be necessary. ARI's Reserve Component Training Research Unit in Boise, Idaho, has developed a proficiency-based strategy that will allow the device-based portion of tank gunnery training to be completed in just three drill weekends. This will enable accurate predictions to be made as to which crews are likely to be first-run TTVIII qualifiers. In addition, this strategy eliminates guesswork in determining which crews should be trained, which devices should be used, which training and evaluation exercises should be conducted, and which performance standards should be applied. It also maximizes the payoff from the time spent training on devices.

THE STRATEGY

Pre-testing

The strategy, as shown in Figure 1, begins with a 60-75 minute pretest on the Conduct-of-Fire Trainer (COFT) to determine the gunnery proficiency level of each crew. Pretesting calls for the firing of four "gate" exercises (131-134) from the COFT's advanced training and evaluation matrix. Once these exercises are fired, their summary scores are added (after subtracting "crew cuts") and divided by 4 to arrive at a total pre-test score. This score is then plugged into Column 1 of Table 1 to find a crew's

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Dr. Edgar M. Johnson
Director

Director's Message

This Newsletter presents a broad spectrum of work to enhance both individual and unit performance: training for success, selection, and the use of virtual terrain among the many topics. Several articles highlight how to train better for success with feedback as a key ingredient. Training without it is at best practice and may even reinforce bad habits. ARI is working on methods to minimize excessive effort or costs that discourage the use of quality feedback. For example, a simulator-based tank gunnery training strategy developed for the Army National Guard provides feedback and makes predictions about which crews are likely to have successful Tank Table VIII qualification. Another type of feedback used Special Forces Operational Detachments to "train the trainer" where experts instructed civilians in Bosnian cities about de-mining methods under realistic conditions.

Dismounted Soldiers in a Virtual Terrain

Controlling costs of operational training is a critical factor in maintaining readiness and a focus of ARI's research. A follow-on to previous Newsletter articles discusses the emergence of virtual terrain as a technology which brings simulation to the ground warrior. The implications are significant. ARI's early role in such innovation has facilitated expansion, incremental uses, and tests of the technology's value for training skills and knowledge needed for the real world.

Selection for Success - Peer Evaluation

Finding ways to improve personnel selection is a continuing ARI goal. The use of peer evaluations is a key element in an article about selection of special forces. This technique coupled with enhancements based on ARI's depth of experience has enabled Special Forces to identify soldiers who are likely to succeed and to provide better feedback as they proceed through the 24 week training program. The result is significant savings in selection and training costs.

The Web

A Newsletter, of course, only can provide a snapshot of ARI's work. The WWW provides information from ARI's more than fifty years of research, survey results, and insights about efficient and improved personnel, performance, and training. This is not only a resource for researchers, but also a valued tool for military leadership and staff seeking to improve knowledge in these areas. Give it a try (http://www-ari.army.mil) and let us know what you think!

predicted average TTVIII score (Column 2) and associated probability of first-run qualification (Column 3). A crew firing 765 on the pretest, for example, would be predicted to fire an average score of 700 on TTVIII (if fired multiple times) and have a 50-50 chance of first-run qualification on the range. (For more information on the tool used for pretesting, see Hagman, J. D. [1996] Army National Guard Tank Gunnery: Predicting Live-Fire Success, ARI Newsletter, Summer 1997.)

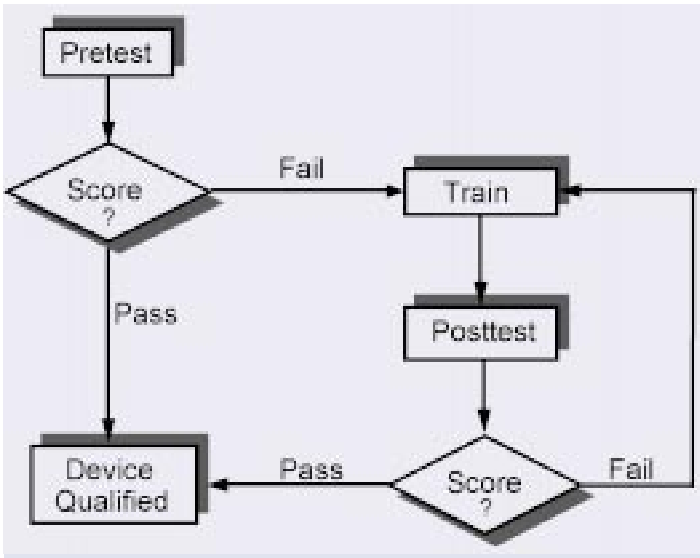


Figure 1

Depending on the standard set by a commander for his unit's first-run TTVIII qualification rate (from Column 3 of Table 1), some crews will pass the pre-test (device-qualified crews) while others will not (device-unqualified crews). According to the strategy, only the latter need to be trained on the devices. Thus, valuable time is not wasted training crews that are already device proficient.

Training

Having identified which crews need to be trained, the next step is to determine which training device(s) to use and which training exercises to conduct. According to the strategy, training can be conducted on either the Conduct-of-Fire Trainer (COFT) or the Abrams Full-Crew Interactive Simulation Trainer (AFIST), and should focus on only the simulated TTVIII engagements not performed to pre-test standard. This standard is

Table 1

COFT Pretest Score	Predicted Average TTVIII Score	Probability of Scoring ≥ 700 on TTVIII
620	562	10%
669	609	20%
706	644	30%
737	673	40%
765	700	50%
793	727	60%
824	756	70%
861	791	80%
910	838	90%

determined by dividing the pre-test score (for example, 765) by 10 (the number of engagements fired per exercise). Any engagements not fired to this standard (for example, 76.5) must be trained. To help with this training, Table 2 shows the training exercises on each device that simulate each TTVIII engagement.

Except for Engagement A2, the simultaneous engagement, which requires use of the Caliber .50 machine gun (which is not simulated by AFIST), we recommend using AFIST whenever possible because of its capability to support full-crew training. If AFIST is not available, we recommend that training alternate between or among the training exercises shown in Table 2 for the COFT. This will add variety and promote the desired device-to-tank transfer.

Regardless of which device is used, we suggest that an easy-to-difficult progression be followed when pre-testing reveals that some crews need training on more than one simulated TTVIII engagement. Table 3 shows the difficulty rankings that we have found recently for live-fire Table VIII

Table 2

TTVIII Exercises	COFT Training Exercises	AFIST Training Exercises
A1	113.117	6AT1
A2	101.11	--
A3	102.106	6AT2
A4	102.106.110	6AT3
A5S	102.106.110	6AT4
A5A	102.106.110	6AT5
B1S	103.107.119	6BT1
B2	105	6BT2
B3	110	6BT3
B4	102.106.110	6BT4
B5	113.117	6AT1
B5A	105	6BT5

engagements. Engagement B5, for example, would be trained before B2, A1 before A3, and so forth.

To make sure that tank crews become device proficient and, at the same time do not pass a training exercise by luck, we recommend that the

Table 3

Engagement	A3	B3	A2	A1	B2	A4	B4	B5	A5S	A5A	B5A	B1S
	Most											Least
Difficulty Ranking	1	2	3	4	5	6.5	6.5	8	9	10	11	12

proficiency standard for training exercises be set at two successful, but not necessarily consecutive, criterion performances. On COFT, criterion performance is reached upon crew receipt of an "advance" recommendation from the device in the areas of target acquisition, reticle aim, and system management. On AFIST, criterion performance is reached upon crew receipt of a "pass" recommendation from the device for the exercise(s) being trained.

Post-testing

Just because a crew passes the training exercises, it does not necessarily mean that it is device qualified. The last step in the strategy is to post-test crews by having them retake the pre-test. Those that pass the post-test are now device qualified; those that fail the post-test must return for further training on devices as outlined above.

Implementation

We have designed the above strategy for unit implementation over three (preferably consecutive) drill weekends once pre-testing is completed. The hour or so needed for pre-testing could be included as part of the Tank Crew Gunnery Skills Test, with Readiness Management Assemblies used if drill time runs out.

Before the first scheduled drill after pre-testing, pre-test scores should be compared against the performance standard for first-run TTVIII qualification set by the unit commander (from Column 3 of Table 1). This will allow identification of device-unqualified crews and the specific engagements they need to fire during training. Similarly, the training results of this and the next two drills should be reviewed to select the right training exercises for those crews not ready for post-testing, and to post-test those that have completed training. Once all crews are device qualified, by virtue of passing either the pre-test or post-test, on-tank training should begin, probably with TTV or with Combat Table I. Regardless of its starting point, on-tank training is important because it allows crews to experience the different aspects of gunnery not practiced or simulated on devices (for example, open-hatch target acquisition, tank movement, and weapon recoil effects) and is important for successful TTVIII qualification.

Conclusions

What will this strategy allow armor unit trainers to do in the future that they cannot do now? For starters, they will be able to schedule device-based training time more efficiently by targeting only crews in need of remediation. They will also know which devices to use and which exercises to conduct when training is called for. And lastly, because device performance standards are keyed to expected live-fire outcomes, they will know when crews have received enough device training to warrant transition to the tank, and what their unit's first-run TTVIII qualification rate will be. After all, tank gunnery training on devices takes time. Although this time is scarce, we think that the new strategy just described provides the tools that armor unit trainers need to use it training wisely.

REFERENCE

Hagman, J.D. & Morrison, J.E. *Research Pays Off For the Guard: A Device-Based Strategy for Training Tank Gunnery.* Armor, 6, 48-50.

For further information contract the U.S. Army Research Institute Reserve Component Training Research Unit, Dr. J.D. Hagman, (208) 334-9390.

Special Guest Visit

Dr. John Annett, Professor Emeritus in the Department of Psychology at the University of Warwick in Coventry, England, made a presentation on the topic "Hierarchical Task Analysis and Teamwork" at ARI. These findings were on team performance measurements, derived from his analysis of the Naval Command Teams in England. He emphasized the work ARI has done on group training versus individual training, and the shared mental models for team plans. For further information, email J.Annett@warwick.ac.uk.

3-D Audio and Visual Improve Performance

A joint research project was performed between the Army Research Laboratory and the Army Research Institute Rotary-Wing Aviation Research Unit to determine the extent to which 3-D audio affects pilot performance in radio communications. Dealing with multiple sources of auditory information, especially when they are presented at the same time as visual information, can be especially challenging. The combined effort of these two research arms is significant in terms of enhancing the soldier's ability to process multiple auditory inputs, and is an important element in improving soldier performance and system safety. For further information contact Dr. Wightman, DSN 558-2834.

Navigating Through Virtual Terrain

ARI Simulation of Mechanized Units Expands to Battlefield Soldiers using Virtual Reality

Networking simulations, such as the Close Combat Tactical Trainer, are being developed to provide cost-effective training of integrated war fighting skills. The current focus of these simulations is on training mechanized units, but this does not adequately address the training needs of dismounted soldiers nor represent their contribution to the outcome of simulated battles. At ARI's Simulator Systems Research Unit, we have been working to integrate dismounted soldiers in the networked simulation battlefield by using virtual environment (VE) technology. Our goal is to determine how best to use VE to provide both individual and collective training and mission rehearsal.

INDIVIDUAL COMBATANT SIMULATION RESEARCH PROGRAM

One current focus of the research program is the investigation of VE technology for training small-unit (platoon, squad, or fire team) leaders. Especially important are the evaluative and decision-making skills that help make effective warfighters and leaders. These skills are learned and performed within the common context of individual combatants who need to move, observe, shoot, and communicate. The research program is designed to investigate whether these basic activities and cognitive skills can be performed and learned adequately in VE, and how well skills learned in VE transfer to the real world.

SPATIAL KNOWLEDGE RESEARCH

A review and analysis of Army Training and Evaluation Programs conducted early in our research program identified major activities that could be performed, trained, or practiced in VE. Many terrain interaction activities were ranked highly for their potential to be trained in VE. Terrain interaction activities require both general terrain appreciation skills and specific spatial knowledge of the operational terrain. Terrain appreciation means understanding and using terrain features in performing tasks such as weapons emplacement, selecting defensive positions, and land navigation. It requires understanding terrain in terms of landmarks, distances, and directions. A major aspect of terrain appreciation is the soldier's ongoing acquisition of spatial knowledge, and an awareness of one's own location relative to significant terrain features.

Previous research conducted in our program (ARI Newsletter, Vol. 14, April 1994) has demonstrated that spatial knowledge can be acquired and transferred to the real world. That research investigated acquisition and transfer of spatial knowledge in a building interior and found that subjects can learn to navigate through real-world places by training in a virtual environment. From a practical standpoint, training in the VE was almost as effective as training in the real building in terms of route learning.

As a continuation of that work, a terrain appreciation experiment was conducted on the acquisition of spatial knowledge in a VE representing a large scale open terrain. That experiment used three learning conditions: High-VE and Low-VE experiences, and Map study. The High-VE configuration presented stereoscopic views in a head-mounted display (HMD) that linked to head motion and controlled Point of View (POV) movement through the environment by walking on a treadmill. The Low-VE configuration used the HMD with gaze direction and POV movement controlled by a joystick. The Map condition required subjects to perform the same exercises as were performed in the VE conditions while studying an enlarged topographical map.

Two computer-generated terrain databases were developed for the experiment, with different types of distinguishing terrain features. Terrain One is an abstract terrain with distinct landmark features (not representative of any specific location) and the other (Terrain Two) is a representation of a training area at Ft. Benning, GA (see Figure 1). The connected X- marks indicate practice locations and the path followed during the learning exercise.

The tests used to determine the level of spatial knowledge acquisition were more difficult than would be expected in the real world. The learners

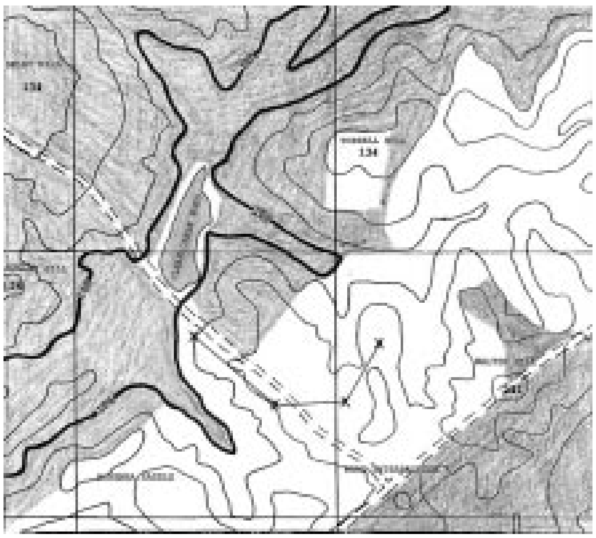


Figure 1

were placed at (teleported to) new locations on the terrains and asked to point to specific landmarks without reference to maps. High-VE trained subjects made a higher percentage of correct directional identifications of landmarks (see Table 1), indicating that they developed better spatial knowledge than subjects trained using topographical maps. A measure that combined multiple distance and direction responses found that High-VE subjects were more consistent in their location of landmarks in the abstract terrain (Terrain One, vs. Terrain Two) than were Low-VE or Map-trained subjects. Terrain One had several features that were more localized (sharply bounded) than the features in Terrain Two. As Table 1 indicates, this led to more consistent landmark location estimates. The more localized features in Terrain One may have provided better cues for distance estimates (an integral part of projective convergence accuracy and consistency), which would lead to the results in Table 1. The results of this single experiment indicate that a more normal interface in a Virtual Environment simulation supports better spatial acquisition.

Performance Means for Different Practice Environments.

Method	Direction % Correct	Projective Consistency* Terrain One	Rank	Terrain Two	Rank
High-VE	**52**	**1144**	**1**	**2073**	**1**
Low-VE	**44**	**1704**	**2**	**2839**	**3**
Map Only	**35**	**2062**	**3**	**2446**	**2**

*smaller values indicate better consistency

Table 1

The next step in this experimental sequence was conducted in conjunction with the ARI Infantry Forces Research Unit at Fort Benning. That experiment used VE equipment and facilities at the Dismounted BattleSpace Battle Laboratory to train soldiers on a representation of Ft. Benning terrain and compare their performance to the VE performance of other soldiers trained using enlarged topographical maps. Both groups were then tested on actual terrain at Ft. Benning, to examine differences in transfer performance.

The VE configuration at Ft. Benning presented a stereoscopic view in a HMD driven by head movements (head-coupling, as with the High-VE in the first experiment) and controlled POV movement through the VE by a joystick (as in the Low-VE condition). The major changes in the target terrain were that a large retention area and drainage ditch along a road was being constructed, and seedlings in another area had grown several feet. Representations of the retention area and ditch were added to the Terrain Two model, but tree growth could not be added in the time available for experiment preparation. Thirty-four male junior officers were recruited from a cadre of soldiers awaiting training to serve as the subjects.

The test of spatial knowledge in the VE was conducted as in the first experiment, teleporting participants to test sites and requiring directional identification and a distance estimation to each landmark as requested by the experimenter. No feedback was given at any time during the spatial knowledge test. After completing the test phase, participants were transported to the field for a transfer test on the modeled terrain.

There was a significant difference between the VE and Map learning when tested in the VE, but no difference was found for transfer to the field (see Figure Two). Performance on the field test was

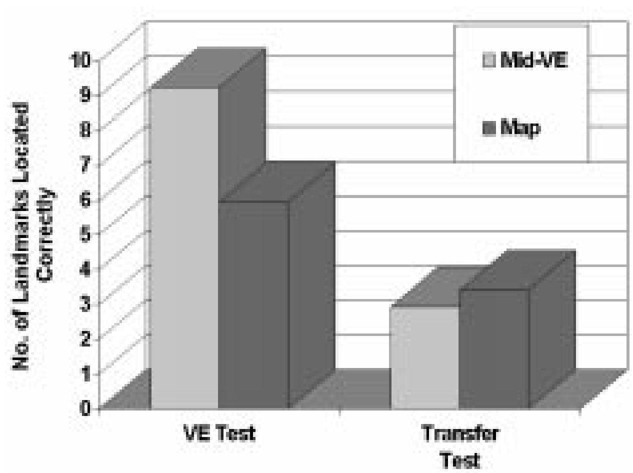


Figure 2

worse than performance on the VE test. The decrement for transfer from simulation is a common one, and the strength of the Map transfer may be a result of the soldier expertise in using maps. In addition, the inexact terrain portrayal by the VE may have misled those subjects, allowing the soldiers to focus on incorrect cues for orientation and landmark identification. The terrain database was topographically correct, but the vegetation colors and textures (especially for areas under construction) were off. These results differ from the building interior transfer research conducted earlier, in understandable ways. The VE replication of a building interior, with distinguishing cues, is easier than the replication of a large-scale natural terrain.

CONCLUSIONS

Our research program has progressed from basic task requirements through psychophysical and psychomotor capabilities and spatial knowledge acquisition, and will soon begin to investigate team training. The navigation research has shown that spatial learning of building interiors is approximately equivalent to learning in the real environment, and open terrain spatial learning in highly interactive VE is better than the knowledge acquired through Map study, when tested in the VE. With representation of appropriate visual cues, training experiences in VE can be expected to provide the skills and knowledge needed to perform in the real world.

For further information contact the U.S. Army Research Institute Simulator Systems Research Unit, Dr. Steve Goldberg, (407) 384-3980.

Using Peer Evaluations in Special Forces Selection and Training

ARI helped redevelop peer evaluations in Special Forces selection and training. The new evaluations help to ensure that different soldiers consider the same attributes when making their evaluations for a given dimension. A ranking format is used which allows comparative judgements to be made among peers, creates an even distribution of scores, and eliminates rater leniency effects.

In 1994 the 1st Special Warfare Training Group (SWTG), at the United States Army John F. Kennedy Special Warfare Center and School (USAJFKSWCS), asked for assistance from ARI to determine how current peer evaluation systems in the Special Forces Assessment and Selection (SFAS) program and Special Forces Qualification Course (SFQC) could elicit the most appropriate information, and how to use it in the most appropriate ways. ARI agreed to provide 1st SWTG with information, recommendations, and materials to enhance the usefulness of peer assessments in SFAS and SFQC.

SFAS is a 21-day assessment program designed to identify soldiers who are likely to succeed in training for Special Forces. Soldiers who are selected from SFAS then attend the SFQC, a training program that is approximately 24 weeks long. Upon graduation from the SFQC, soldiers receive the SF tab.

MAKING RECOMMENDATIONS

An assessment of the current system indicated that both SFAS and SFQC could benefit from obtaining more specific information from peers. ARI recommended that peers be asked to evaluate each other using specific performance dimensions relevant to SFAS and SFQC, and that peer raters be provided with descriptions of the behaviors they should be considering when making their decisions. These descriptions would ensure that different soldiers consider the same attributes when making their evaluations for a given dimension.

In making recommendations for the design of the SFAS and SFQC forms, we felt it was important to recognize that the two programs use peer evaluation information for different goals. In SFAS, peer evaluations are used by the board, in combination with other performance information, to make select/non-select decisions. In the SFQC, on the other hand, the primary objective of the peer assessment information is to give the student feedback on his strengths and weaknesses in the course.

Our recommendations for the design of the SFAS and SFQC evaluations differed because SFAS and SFQC have different goals. For SFAS, we recommended obtaining peer rankings across three dimensions: effort/persistence, leadership, and interpersonal skills. These dimensions were determined through interviews with SFAS soldiers, reviews of the SFAS program, and psychometric analysis of pilot data. Because SFAS uses peer evaluation information to assist in making selection decisions, we recommended that they continue to use the ranking format. The ranking format forces comparative judgments to be made among peers, creates an even distribution of scores, and completely avoids rater leniency effects.

For the SFQC, we recommended obtaining peer evaluations across six dimensions: effort/persistence, teamwork, interpersonal, physical, leadership, and tactical skills. The objective of peer assessments in the training setting is to give the student descriptive feedback, so we recommended using a rating format instead of rankings. The feedback that students are given must be relevant to the standards of the course, and not dependent upon the high or low performance of the other members of his team. Using a rating format allows each rating to be independent, and, for example, allows the same score to be given to multiple soldiers if, in fact, they perform at a similar level.

While we only specifically evaluated the use of peer evaluations for the first phase of the SFQC, we recommended that the other phases be examined to determine their appropriateness for obtaining reliable and valid peer evaluations.

DEVELOPING SOLUTIONS

In 1995, ARI delivered a report detailing our recommendations for changes to the peer evaluation systems. 1st SWTG adopted many of the recommendations, and together we developed an action plan for change. Implementing these changes required that efficient systems be developed to ensure a quick response time for processing peer evaluations. ARI worked with personnel from an optical scanning company to develop custom designed forms that could be scanned instead of hand processed, and 1st SWTG purchased the scanning forms and equipment. A computer programmer designed programs that check the scanned data for errors and generate reports to be used for selection or training, and included in the soldier's file.

The final requirement was to ensure that the personnel who needed to use the new reports understood how to use them. For SFAS, this was fairly simple because the new information had the same format as the previous one; it was just more specific. Making the transition to the new system required more effort for the SFQC, however, since the information had a different format - rating data instead of rankings. To help SFQC cadre understand how to incorporate the new peer evaluation information in their counseling sessions, ARI developed a Peer Evaluation Handbook, which cadre use as a reference manual, and which the company uses to conduct group-level training.

IMPLEMENTATION & EVALUATION

ARI originally pilot tested the new peer evaluation form for SFAS in September of 1995. The SFAS Selection Board members during the next two classes were surveyed, and all members indicated that the new peer forms were more useful and should be continued. SFAS continued to use the pilot form, and in February of 1997 the automated processing system was introduced. With nearly two years of data collected, a psychometric evaluation of SFAS peer evaluations is planned.

In SFQC, pilot forms were tested in phase I during the last three classes of FY95, and the scanable forms and automated processing systems were implemented starting in April 1997. A preliminary psychometric evaluation of the pilot data showed positive results. Interrater reliabilities were high, ranging from .77 for interpersonal skill to .91 for tactical skill, and all of the ratings evidenced a fairly full range of scores.

This project is one of several assessment-related projects in which we have been involved with 1st SWTG. For a description of our other research in this area over the past seven years, see our special report published in October 1997, entitled "Enhancing U.S. Army Special Forces: Research and Applications", edited by Dr. Judith E. Brooks and Dr. Michelle M. Zazanis.

For further information, please contact Dr. Michelle Zazanis, U.S. Army Research Institute Organization and Personnel Resources Research Unit, DSN 767-0318 or (703) 617-0318.

New Thinking Strategies for Training Situation Assessment

Performance Results: Improved Concepts, Reasoning, and Decisions

Research performed at ARI on training in new thinking strategies has shown that these strategies result in marked improvements in accuracy of battlefield situation assessment. Officers who received training in the strategies showed accuracy levels of up to twice the level of those who did not receive the training. This result was found by placing one group of officers in a classroom for 90 minutes and training them on three strategies. Another group served as the control and completed various surveys for the same time period. After the training, both groups of participants were given tactical problems to assess. Performance was measured by comparing a participant's reasoning about the assessments to that of a senior military expert . [1]

During the last five years, the Fort Leavenworth Research Unit of ARI has studied the human dimensions of Battle Command. The underlying premise of this research is that tactical information does not directly equate to knowledge. Battle commanders must go beyond information and perform a thorough assessment of the situation in order to gain a complete understanding of it. One of the most important determinants of effective decision making is the quality of the battle commander's evaluation of the situation.

For centuries, armies have attempted to improve the quality of battle commanders' situation assessments by increasing the quality and quantity of battlefield information. With the advent of the digitized battlefield, the U.S. Army may be close to achieving the goal of having real-time information available on most aspects of the tactical situation. However, even having the best possible information will not be enough; quality leaders who can quickly understand the information will still remain as important as ever. These leaders must have conceptual skills that promote rapid and thorough situation assessment.

[1] The expert was a retired Lieutenant General with extensive command and staff experience.

Army doctrine and classroom instruction treat situation assessment as a step-wise process involving aggregation and evaluation of information. The usual emphasis is on a sequential model; this implies that if a commander and staff follow a given procedure they will arrive at good situation assessments. However, other research has shown that those who are proficient at situation assessment do not rely on this model.

Field grade officers were observed to see how they think about tactical problems. We found that proficient decision makers construct complete and coherent mental models of the situation. Since uncertainty abounds in most real problems, decision makers need to fill in holes in the mental pictures they construct. When there is neither time nor inclination to gather more information to fill in the gaps, assumptions are made, often unknowingly.

Filling gaps in situation models with untested or unrealized assumptions is a major danger, especially when it involves accepting the first understanding that fits together as a coherent story or picture. This quick step from perception to "understanding" is how most of us think in our everyday lives when the stakes are low. When stakes are high, it becomes more important to counter dangers associated with hidden assumptions.

To help, we developed training in three strategies. The first strategy urges the students to consider what could be wrong even when they feel very certain about their assessment, to explain why, and to come up with alternative assessments. In effect, the strategy guides the problem solver to look for hidden assumptions (see Figure 1). To find hidden assumptions the problem solver is urged to ask two simple questions: "what if (this were not the case)?" and "what else (could be the explanation)?" The second strategy shows how to resolve conflicts in battlefield information. Resolution is important because there is a tendency to ignore information that comes after one has settled on an understanding of a situation, especially if the new information does not fit into the current pattern. The third strategy is like medical triage, in that it's a quick survey of issues in order to decide when and what to think about. This increases the thinker's sensitivity to taking note of how much time is available for in-depth thinking, how important this problem is relative to others, and how familiar he or she is with the situation.

The officers who were trained in the three strategies generated more accurate arguments than the control group who did not receive the training (see Figure 2). Not all gains were as dramatic as those for the force superiority assessment. For other assessments the gain was about 25 percent and for some there were no significant differences. The increases in performance seemed to be due to better judgments about the relevancy and plausibility of possible understandings of the situations. Another important finding was that training to question assumptions did not diminish an officer's confidence in his or her judgment. Training also influenced the officers to attend to new information and assess it fairly.

Following the experimental demonstration of the merit of the strategies, the training was incorporated into a prototype course for the Command and General Staff College. Over 70 students received this instruction. Students had positive impressions about the training irrespective of their time in the military.

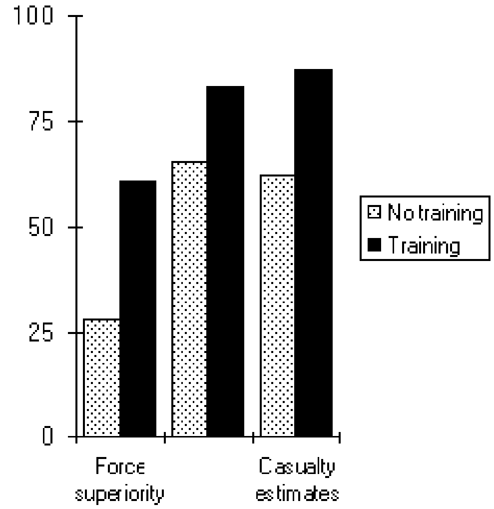


Figure 2. Example Assessments

Suppose there is an assessment that claims the enemy will cross a river at location x. The claim is based on indicators concerning the distance the enemy must travel to his objective, the shallow depth of the river, and concealment opportunities along the bank. Although confident, stakes are high and there is time to critique the assessment, so the officer chooses to do so. He imagines a "perfect intelligence source" that tells him that the enemy will not cross at location x, and directs that this failure be explained. Cycling through "what if" and "what else" questions might generate the following list of reasons why the enemy will not cross at location x.

> The enemy anticipates that our force will be at location x.
> The enemy will detect the movement of our force to location x.
> There are good crossing sites elsewhere that we missed.
> The enemy doesn't have any river crossing assets; he can't cross the river at all.
> The enemy's river crossing assets are so good that he can cross elsewhere.
> The enemy has a large enough force that he can accept casualties crossing elsewhere.
> The enemy's objectives are different; he doesn't need to cross at all.
> The enemy will use air assault to get across the river.

Figure 1. Training Example

The students estimated a 20 percent gain in their skill of finding hidden assumptions.

Perhaps even more important than the success of the training was the demonstration of the utility of a cognitive approach to improving battle command performance. Cognitive research methods led to an analysis of current strengths and weaknesses in situation assessment, production of ideas for improving thinking strategies, measurement of increases in thinking due to the training, and successful implementation in battle command education. As a whole, this program of research illustrates the benefits of a cognitive approach to understanding and enhancing the complex business of battle command. And there is more to be done. Similar research should be applied to better understand differences *among* Army leaders and to develop training for additional thinking strategies.

For further information see ARI Technical Report 1050, "*Training critical thinking skills for battlefield situation Assessment: An experimental test*," ARI Research Product 97-07, "*Methods for training cognitive skills in battlefield situation assessment*," and ARI Research Report 1685, "*Overview of practical thinking instruction for battle command*," or contact Dr. Jon Fallesen, ARI Fort Leavenworth Research Unit, Fort Leavenworth, KS, DSN: 552-4933/Commercial (913) 684-4933.

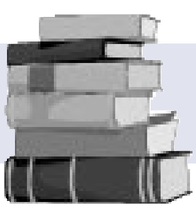
The ARI Web Page

www-ari.army.mil

What a resource! There are over fifty years of ARI materials collected on the web pages. The hottest hit now is the "Command Climate Survey". This is a self-executable file, providing commanders with a scoring worksheet and a questionnaire. It produces a summary of results trail, pie charts or display data from a single question.

New to the web site is the Combat Leader's Guide. This guide is a pocket-sized reference used during realistic combat training. Another new addition to the web site is a section on Special Forces. This effort encompasses 1990-1997 personnel and training research, with comprehensive overview and specific implications of the research for the broader Army. Other valued new products include the "Azimuth Leadership Check" and TAAF (Training, Analysis and Feedback), a study for live training support.

It's worth checking the library web page for current resources, plus the DARS (Document Archival and Retrieval System). This section is exclusive to ARI's own technical documents. The DARS database contains over 300,000 text and image pages. Give the web site a try: http://www-ari.army.mil



Book Review

The text, Models and Theories of Executive Leadership: A Conceptual/Empirical Review and Integration, by Stephen J. Zaccaro is a helpful tool in understanding theories of leadership. It helps one comprehend the broad range of work on executive leadership, known variously as senior leadership, organizational leadership, and strategic leadership. This book assembled, synthesized, and integrated a great quantity of information on a topic of immense significance to any student of leadership.

Zaccaro, Stephen J. (1996). Models and Theories of Executive Leadership: A Conceptual/Empirical Review and Integration. Alexandria, VA:U.S. Army Research Institute for the Behavioral Sciences. DTIC AD #A320259

De-Mining Training in Bosnia

The soldiers moved slowly across a Bosnian field which was potentially strewn with mines. Several of the men carefully probed the ground for mines hidden beneath the surface. Others slowly maneuvered their metal detectors above the ground listening for the slightest hint of metal (many of the mines were made almost entirely of plastic). A sudden explosion startled the men. The intentionally detonated mine shook the ground, sending debris flying and serving again as a reminder of the seriousness of the de-miners' work.

Millions of mines hidden throughout Bosnia during nearly four years of conflict are still waiting for someone to take a wrong step. These mines do not discriminate on the basis of political affiliation, religion, or ethnicity; they will maim or kill anyone, and often it is the children that suffer the most. Approximately five million mines and other explosives are still buried in Bosnia. This places severe limitations on returning the area to normal conditions, prompting the United States State Department and Department of Defense (DOD) to initiate a humanitarian assistance program to train Muslim, Croat, and Serb civilians to de-mine their country.

Special Forces Operational Detachments, or “A Teams”, were asked to play a critical role in this program. "A Teams" are composed of NCOs with Military Occupational Specialties in Weapons, Engineering, Medicine, and Communications. The teams trained groups of civilians in four Bosnian cities: Ethnic Croats were trained in Mostar, Muslims in Tuzla, Serbs in Banja Luka, and Eastern Slavonians in Brus. The technique used is called “Training the Trainer”, and it is a natural fit for Special Forces. In Bosnia, the SF engineers provided training on de-mining techniques, while their fellow medics trained personnel on emergency medical procedures that might be required for the high-risk operation. SF Officers and Non-Commissioned Officers provided training on the leadership skills required for groups to organize and efficiently perform safe de-mining operations.

Forty-two soldiers from the 10th Special Forces Group, headquartered at Fort Carson, Colorado, performed the training with an A Team (in this case, seven to nine soldiers) at each of the four sites. CPT Brian Earl, one of the primary planners and organizers of the de-mining training, pointed out that Special Forces are trained in a foreign language, and because of their appreciation for cultural diversity, they are perfectly suited for this type of mission. Special Forces NCOs and Officers frequently live in other countries, training "host nation" personnel, and learn to understand and work with a myriad of intercultural differences.

The personnel assigned to Special Forces units are competitively selected and are truly special and talented personnel. It is not surprising that the most important characteristics for effective performance of Special Forces NCOs are the ability to be a team player, maturity, dependability, judgment and decision making, and adaptability (Russell et al., 1994). The sensitive political nature of the de-mining training demanded that the soldiers exhibit these characteristics. Additionally, applicants to Special Forces undergo a demanding sequential process that screens candidates for core personal characteristics and other job related characteristics (Carlin & Sanders, 1996). Successful applicants complete 23 days of selection and assessment. If they are selected, they spend another 6-12 months in the Special Forces Qualification Course.

Special Forces soldiers are trained and prepared to carry out missions independently or support conventional forces across the entire spectrum of conflict. “Special Forces has been training foreign soldiers for as long as they have existed”, says COL Fuller, Commander, 10th Special Forces Group. This training is a part of the performance of the five primary Special Forces missions -- foreign internal defense, unconventional warfare, direct action, special reconnaissance, and counter-terrorism -- and the five collateral activities - security assistance, humanitarian assistance, antiterrorism, counternarcotics, and search and rescue.

"Most of the trainees at all four sites were prior military, and many of these trainees had some experience with demolitions", said SGM Mangum, one of the medic trainers. "The trainees had some input into the selection of the topics addressed during the training. For this reason, the instruction varied slightly from site to site", Mangum said. "For example, at one site the trainees chose not to include medical training and to spend more time on leadership training and land navigation, which is essential for locating and marking mine fields."

"Most of the mines were buried in the Zone of Separation, that was formerly the front line of the war," said CPT Earl. "The locations of many of the mine fields were recorded by each of the warring factions," Earl said, "but the real problem is the mines that were moved from one location to another by private citizens trying to protect their houses and farms." The Special Forces training was the first step in a long-term de-mining process that is estimated to take 30-40 years to accomplish.

Special Forces soldiers have been called the "Quiet Professionals" because the missions they

Table 1

Special Forces Roles and Job Performance Categories

Role	Performance Categories
Teacher	A. Teaching Others
Diplomat	B. Building and Maintaining Effective Relationships with Indigenous Populations
	C. Handling difficult Interpersonal or Intercultural Situations
	D. Using and Enhancing Own Language Skills
Professional	E. Contributing to the Team Effort and Morale
	F. Showing Initiative and Extra Effort
	G. Displaying Honesty and Integrity
Planner	H. Planning and Preparing for Missions
	I. Decision Making
Soldier/ Survivor	J. Confronting Physical and Environmental Challenges
	K. Navigating in the Field
	L. Troubleshooting and Solving Problems
	M. Being Safety Conscious
	N. Administering First Aid and Treating Casualties
Administrator	O. Handling Administrative Duties
Weapons Expert	P. Operating and Maintaining Direct-Fire Weapons
	Q. Employing Indirect-Fire Weapons and Techniques
Engineer	R. Employing Demolitions Techniques
	S. Constructing for Mission-Related Requirements
Communications	T. Following Communications Procedures and Policies
	U. Assembling and Operating Commo Equipment
Medic	V. Evaluating and Treating Medical Conditions and Injuries
	W. Determining and Administering Medications and Dosages
	X. Ensuring Standards of Health-Related Facilities, Conditions, and Procedures
Leader	Y. Considering Subordinates
	Z. Providing Direction

routinely perform call them to all corners of the world and, in most cases, the missions they perform are out of the public eye. In many operations, the Special Forces soldiers are the only United States personnel in a region. Their actions represent the United States, and it is imperative that they demonstrate the core personal attributes mentioned earlier (Russell et al., 1994).

The de-mining training is an illustration of the diverse capabilities of Special Forces soldiers. Table 1 shows the diverse roles they must perform across the different job performance categories found throughout their missions (Russell et al., 1994). The next assignment for these 10th SF Group NCOs may involve any of the other seven primary missions or collateral activities in a number of different countries, and may require many different skills and abilities. For example, CSM Janis stated that 10th Special Forces soldiers were asked to respond rapidly to a request for a search and rescue mission when Secretary of Commerce Ron Brown's aircraft went down in the mountains near Sarajevo. The severe weather that contributed to the aircraft accident also made the search and rescue mission extremely challenging. The core personal characteristics discussed earlier (maturity, teamwork, dependability, judgment/decision making, and adaptability), plus the Special Forces soldiers' expertise and experience in mountain climbing contributed to their rapid movement. This enabled them to be the first rescue group to arrive and provide assistance at the aircraft accident site.

COL Fuller stated that the 10th Special Forces Group also played a major role in providing humanitarian assistance to Kurdish refugees who were forced to flee from Saddam Hussein's Iraqi forces in Northern Iraq. This same group of soldiers provided additional assistance in the relocation of hundreds of Kurdish refugees.

It is no surprise that Special Forces soldiers are able to move so quickly from one diverse mission to another and be consistently successful. This may have a great deal to do with one of the most critical parts of the SF development; this is the mentoring provided to the new SF NCOs by the more senior NCOs on the A Teams.

The result of the selection and assessment process, focused training, and on-the-job mentoring is a skilled soldier who demonstrates the core personal characteristics that enable him to be effective in de-mining training in Bosnia, challenging mountainous search and rescue missions, or humanitarian assistance operations.

For further information, contact Dr. Michael G. Sanders at the ARI Scientific Research Office, PO Box 71358, Fort Bragg, NC 28307-1358.

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Research Colloquium


The large scale exchange of information found in today's business world is unprecedented due to increases in technology. There do still exist traditional formats that provide a forum for such interactions. The Research Colloquium held periodically at ARI is one such venue. Psychologists representing several generations meet to exchange, comment, and critique their work. One of the topics at the most recent gathering included Dr. Mark Young (shown), presenting "Development of a Faking-Resistant Temperament Measure: The Assessment of Individual Motivation (AIM)".

ARI-Sponsored Video Wins Industry Award

The Communicator Awards is a national awards organization that recognizes outstanding work in the communications field. Entries are judged by a panel of professionals who look for organizations and individuals whose talent exceeds a high standard of excellence and whose work serves as a benchmark for the industry. About twenty percent of entries for the year 1996 won the "Award of Distinction" for projects that exceed industry standards in conveying an organization's message. Among these was Moonlight Communications of Fayetteville, NC, who produced a video on Special Forces in association with ARI's Special Forces research team.

Dr. Michelle Zazanis of ARI envisioned the video and wrote the script, as well as identifying the graphics or the type of video footage to be shown along with the narration. She also coordinated and supervised videotaping of SFQC and ARI personnel, and identified segments of archived video material that would be appropriate for different parts of the new video.

Moonlight Communications provided feedback on the script, chose the specific footage that would be used and how much of each clip would be used, directed the narration, chose music (based on Dr. Zazanis' description of what was wanted), created transitions, and made decisions about matters such as timing, colors, and sound levels.

In addition, in 1997, Moonlight Communications won the "Award of Excellence" for videography (production, shooting, and editing) from The Videographer Awards for the same product, an award only won by twelve percent of entries.

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